

SECRET
CONFIDENTIAL

Fig. 4B

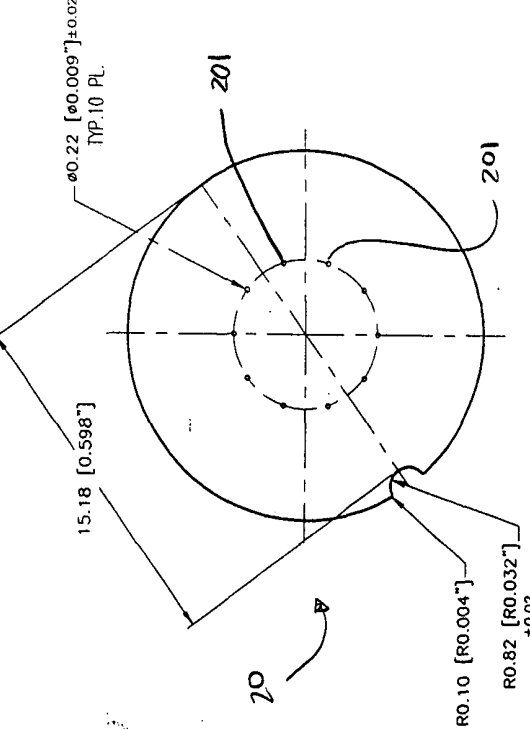
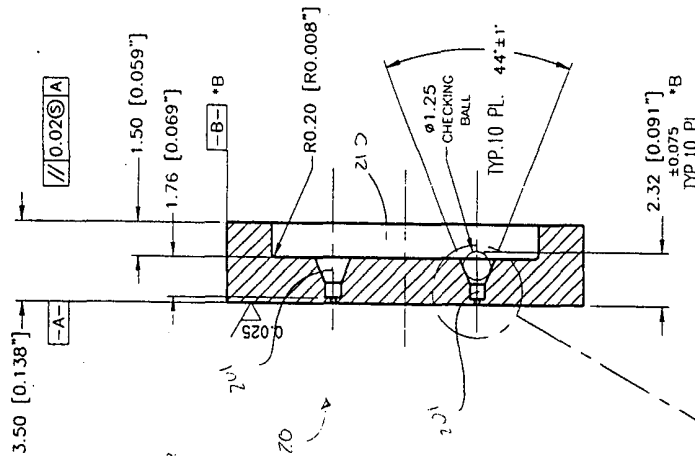
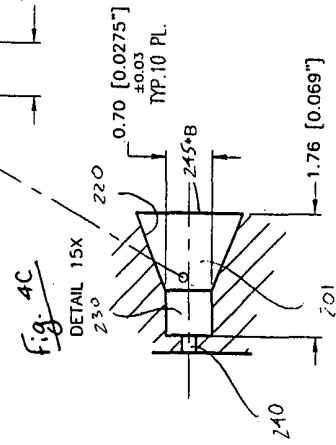


Fig. 4C

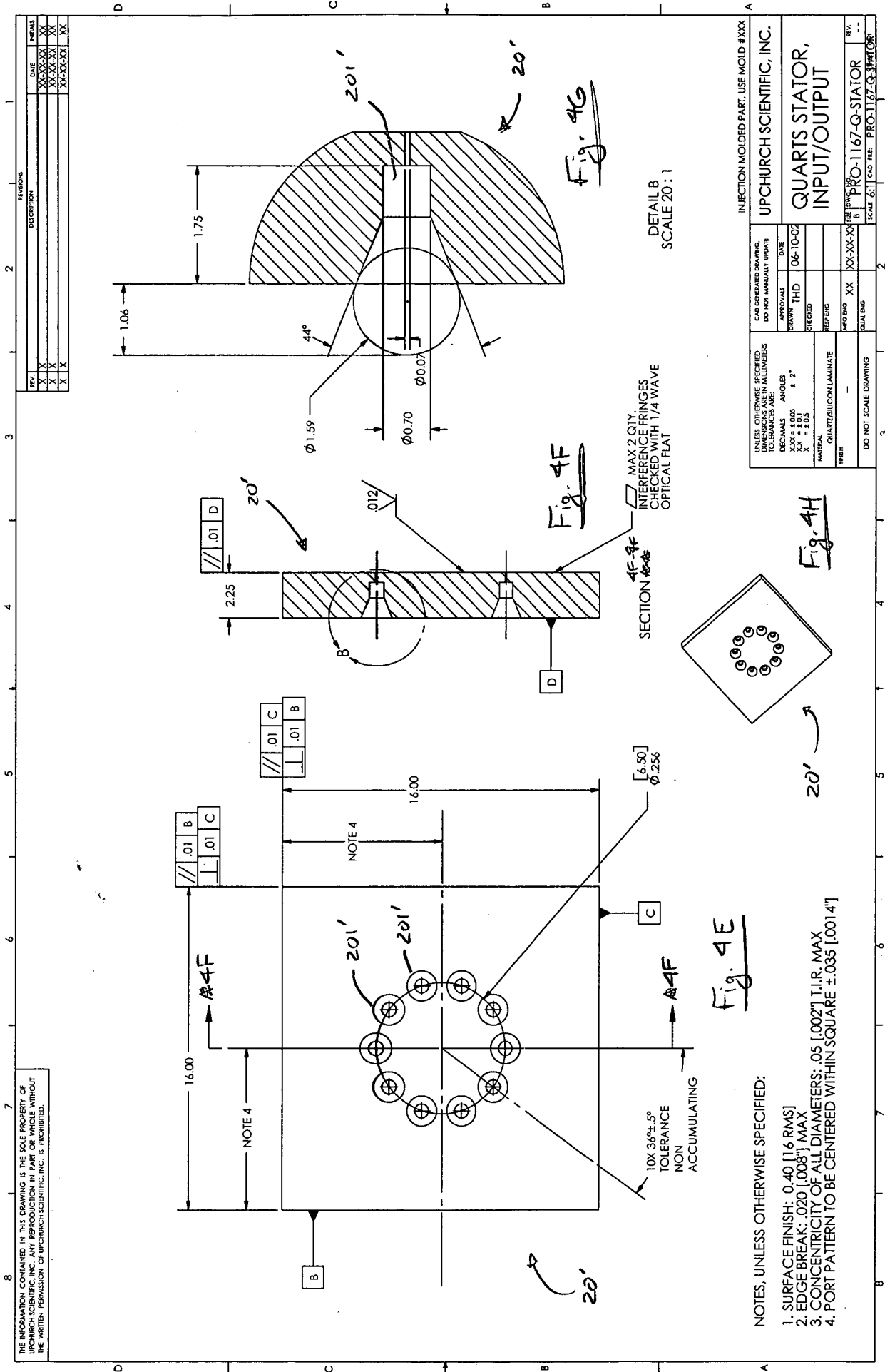


RELATED PARTS:

METRIC DIMENSIONS

| | | | |
|--|--|--|--|
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| MATERIAL: ZIRCONIA | | | |
| SCALE: (METRIC) 5:1 | | | |
| TITLE: 10 PORT STATOR. (MICRO INJECTION VALVE) | | | |
| DRAWN: HS DATE: 12-19-00 | | | |
| CHECKED: HS DATE: 12-05-00 | | | |
| PART NUMBER: PRO-1167-10PT-SIA-1 | | | |
| UPCHURCH SCIENTIFIC, INC. | | | |

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- NOTES, UNLESS OTHERWISE SPECIFIED:
1. SURFACE FINISH: 0.40 [1.6 RMS]
 2. EDGE BREAK: .020 [0.008] MAX
 3. CONCENTRICITY OF ALL DIAMETERS: .05 [0.002] T.I.R. MAX
 4. PORT PATTERN TO BE CENTERED WITHIN SQUARE ±.035 [0.014]

Fig. 4E

Fig. 4F

Fig. 4G

Fig. 4H

DETAIL B
SCALE 20:1

| | | | |
|--------------------------------------|-------------|----------|------|
| INJECTION MOLDED PART, USE MOLD #XXX | | | |
| UPCHURCH SCIENTIFIC, INC. | | | |
| QUARTZ STATOR, INPUT/OUTPUT | | | |
| PRO-1167-Q-STATOR | | | |
| REV | DESCRIPTION | DATE | APPR |
| 1 | | XX-XX-XX | XX |
| 2 | | XX-XX-XX | XX |
| 3 | | XX-XX-XX | XX |
| 4 | | XX-XX-XX | XX |
| 5 | | XX-XX-XX | XX |
| 6 | | XX-XX-XX | XX |
| 7 | | XX-XX-XX | XX |
| 8 | | XX-XX-XX | XX |
| 9 | | XX-XX-XX | XX |
| 10 | | XX-XX-XX | XX |
| 11 | | XX-XX-XX | XX |
| 12 | | XX-XX-XX | XX |
| 13 | | XX-XX-XX | XX |
| 14 | | XX-XX-XX | XX |
| 15 | | XX-XX-XX | XX |
| 16 | | XX-XX-XX | XX |
| 17 | | XX-XX-XX | XX |
| 18 | | XX-XX-XX | XX |
| 19 | | XX-XX-XX | XX |
| 20 | | XX-XX-XX | XX |
| 21 | | XX-XX-XX | XX |
| 22 | | XX-XX-XX | XX |
| 23 | | XX-XX-XX | XX |
| 24 | | XX-XX-XX | XX |
| 25 | | XX-XX-XX | XX |
| 26 | | XX-XX-XX | XX |
| 27 | | XX-XX-XX | XX |
| 28 | | XX-XX-XX | XX |
| 29 | | XX-XX-XX | XX |
| 30 | | XX-XX-XX | XX |
| 31 | | XX-XX-XX | XX |
| 32 | | XX-XX-XX | XX |
| 33 | | XX-XX-XX | XX |
| 34 | | XX-XX-XX | XX |
| 35 | | XX-XX-XX | XX |
| 36 | | XX-XX-XX | XX |
| 37 | | XX-XX-XX | XX |
| 38 | | XX-XX-XX | XX |
| 39 | | XX-XX-XX | XX |
| 40 | | XX-XX-XX | XX |
| 41 | | XX-XX-XX | XX |
| 42 | | XX-XX-XX | XX |
| 43 | | XX-XX-XX | XX |
| 44 | | XX-XX-XX | XX |
| 45 | | XX-XX-XX | XX |
| 46 | | XX-XX-XX | XX |
| 47 | | XX-XX-XX | XX |
| 48 | | XX-XX-XX | XX |
| 49 | | XX-XX-XX | XX |
| 50 | | XX-XX-XX | XX |
| 51 | | XX-XX-XX | XX |
| 52 | | XX-XX-XX | XX |
| 53 | | XX-XX-XX | XX |
| 54 | | XX-XX-XX | XX |
| 55 | | XX-XX-XX | XX |
| 56 | | XX-XX-XX | XX |
| 57 | | XX-XX-XX | XX |
| 58 | | XX-XX-XX | XX |
| 59 | | XX-XX-XX | XX |
| 60 | | XX-XX-XX | XX |
| 61 | | XX-XX-XX | XX |
| 62 | | XX-XX-XX | XX |
| 63 | | XX-XX-XX | XX |
| 64 | | XX-XX-XX | XX |
| 65 | | XX-XX-XX | XX |
| 66 | | XX-XX-XX | XX |
| 67 | | XX-XX-XX | XX |
| 68 | | XX-XX-XX | XX |
| 69 | | XX-XX-XX | XX |
| 70 | | XX-XX-XX | XX |
| 71 | | XX-XX-XX | XX |
| 72 | | XX-XX-XX | XX |
| 73 | | XX-XX-XX | XX |
| 74 | | XX-XX-XX | XX |
| 75 | | XX-XX-XX | XX |
| 76 | | XX-XX-XX | XX |
| 77 | | XX-XX-XX | XX |
| 78 | | XX-XX-XX | XX |
| 79 | | XX-XX-XX | XX |
| 80 | | XX-XX-XX | XX |
| 81 | | XX-XX-XX | XX |
| 82 | | XX-XX-XX | XX |
| 83 | | XX-XX-XX | XX |
| 84 | | XX-XX-XX | XX |
| 85 | | XX-XX-XX | XX |
| 86 | | XX-XX-XX | XX |
| 87 | | XX-XX-XX | XX |
| 88 | | XX-XX-XX | XX |
| 89 | | XX-XX-XX | XX |
| 90 | | XX-XX-XX | XX |
| 91 | | XX-XX-XX | XX |
| 92 | | XX-XX-XX | XX |
| 93 | | XX-XX-XX | XX |
| 94 | | XX-XX-XX | XX |
| 95 | | XX-XX-XX | XX |
| 96 | | XX-XX-XX | XX |
| 97 | | XX-XX-XX | XX |
| 98 | | XX-XX-XX | XX |
| 99 | | XX-XX-XX | XX |
| 100 | | XX-XX-XX | XX |

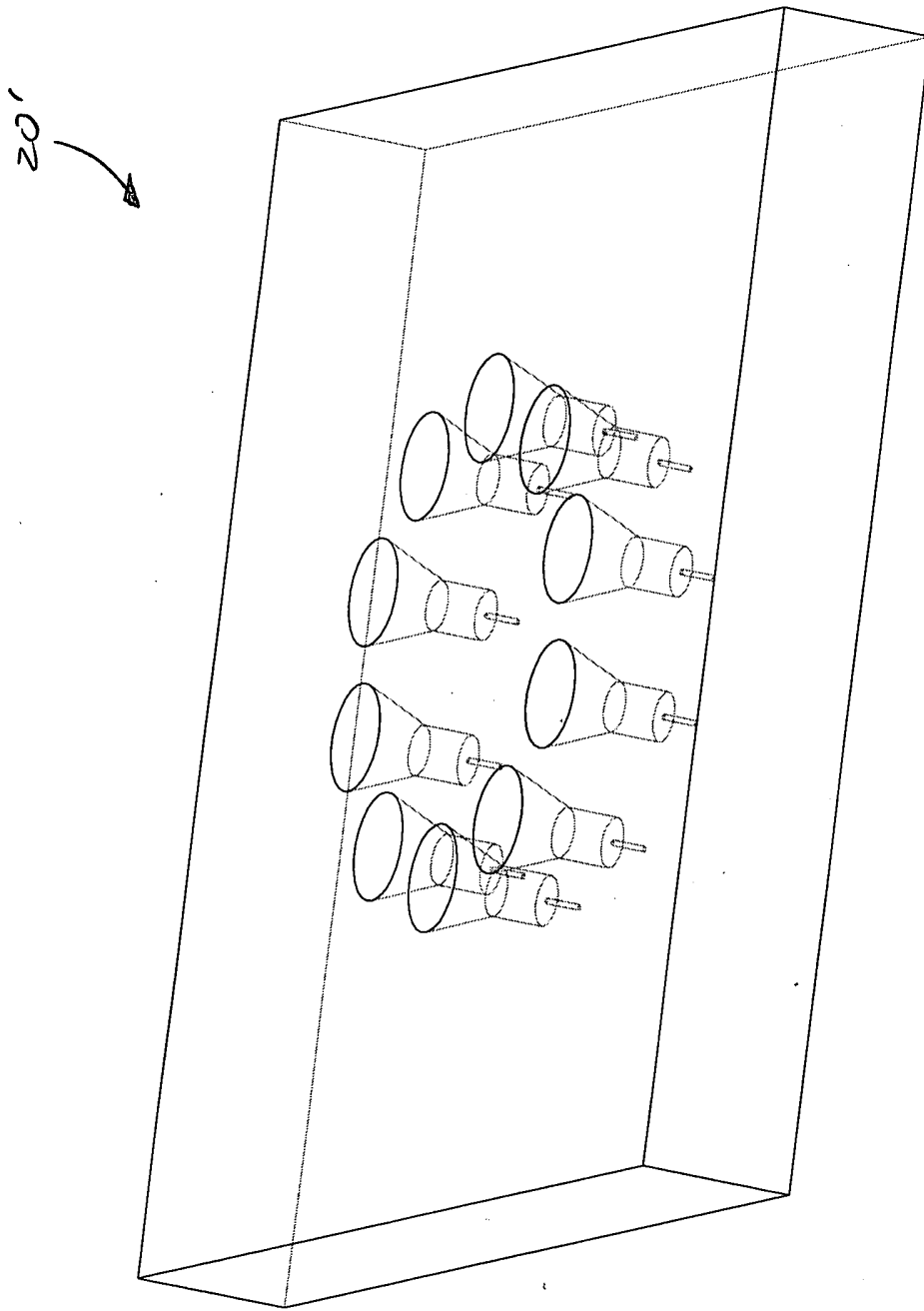


Fig. 4I

FIGURE 1

SECTION A-A

DETAIL B SCALE 40 : 1

DETAIL C SCALE 40 : 1

Fig. 4L

Fig. 4K

Fig. 4J

NOTES, UNLESS OTHERWISE SPECIFIED:

- SURFACE FINISH: 0.40 [16 RMS]
- EDGE BREAK: .020 [.008"] MAX
- CONCENTRICITY OF ALL DIAMETERS: .05 [.002"] T.I.R. MAX
- PORT/GROOVE PATTERN TO BE CENTERED WITHIN SQUARE ±.035 [.0014"]

CAD GENERATED DRAWING DO NOT MANUALLY UPDATE

| REV. | DESCRIPTION | DATE |
|------|-------------|----------|
| XX | XX-XX-XX | XX-XX-XX |
| XX | XX-XX-XX | XX-XX-XX |
| XX | XX-XX-XX | XX-XX-XX |
| XX | XX-XX-XX | XX-XX-XX |
| XX | XX-XX-XX | XX-XX-XX |
| XX | XX-XX-XX | XX-XX-XX |

UPCHURCH SCIENTIFIC, INC.

SIDEPORT STATOR INPUT/OUTPUT

QUARTZ, SILICON

FRESH

DO NOT SCALE DRAWING

SCALE 5:1 CAD FILE PRO-1167-Q-SIDEPORT SHEET 1 OF 1

1. SURFACE FINISH: 0.40 [16 RMS]
2. EDGE BREAK: .020 [0.08"] MAX
3. CONCENTRICITY OF ALL DIAMETERS: .05 [0.002"] T.I.R. MAX
4. PORT/GROOVE PATTERN TO BE CENTERED WITHIN SQUARE ±.035 [.0014"]

Fig. AK

SECTION A-A

2-20"

| | | | | | | | |
|--|--------|------------------------|------|-----------------------|----------|---------------------------|-----------------|
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS TOLERANCES ARE: | | DO NOT MANUALLY UPDATE | | C&G ORIGINATE DRAWING | | UPCHURCH SCIENTIFIC, INC. | |
| DECIMALS | ANGLES | APPROVALS | DATE | SIZE | FWG NO. | REV. | |
| X = ± 0.05 | ± ° | DRAWN | THD | 06-11-02 | B | | |
| X = ± 0.02 | | CHECKED | | | | TCO-1167-Q-SIDEPORT | 1167-Q-SIDEPORT |
| X = ± 0.5 | | REF ENG | | | | 1167-Q-SIDEPORT | 1167-Q-SIDEPORT |
| MATERIAL QUARTZ, SILICON | | FWG ENG | | XX | XX-XX-XX | | |
| FINISH | | QUAL ENG | | | | | |
| DO NOT SCALE DRAWING | | | | | | | |

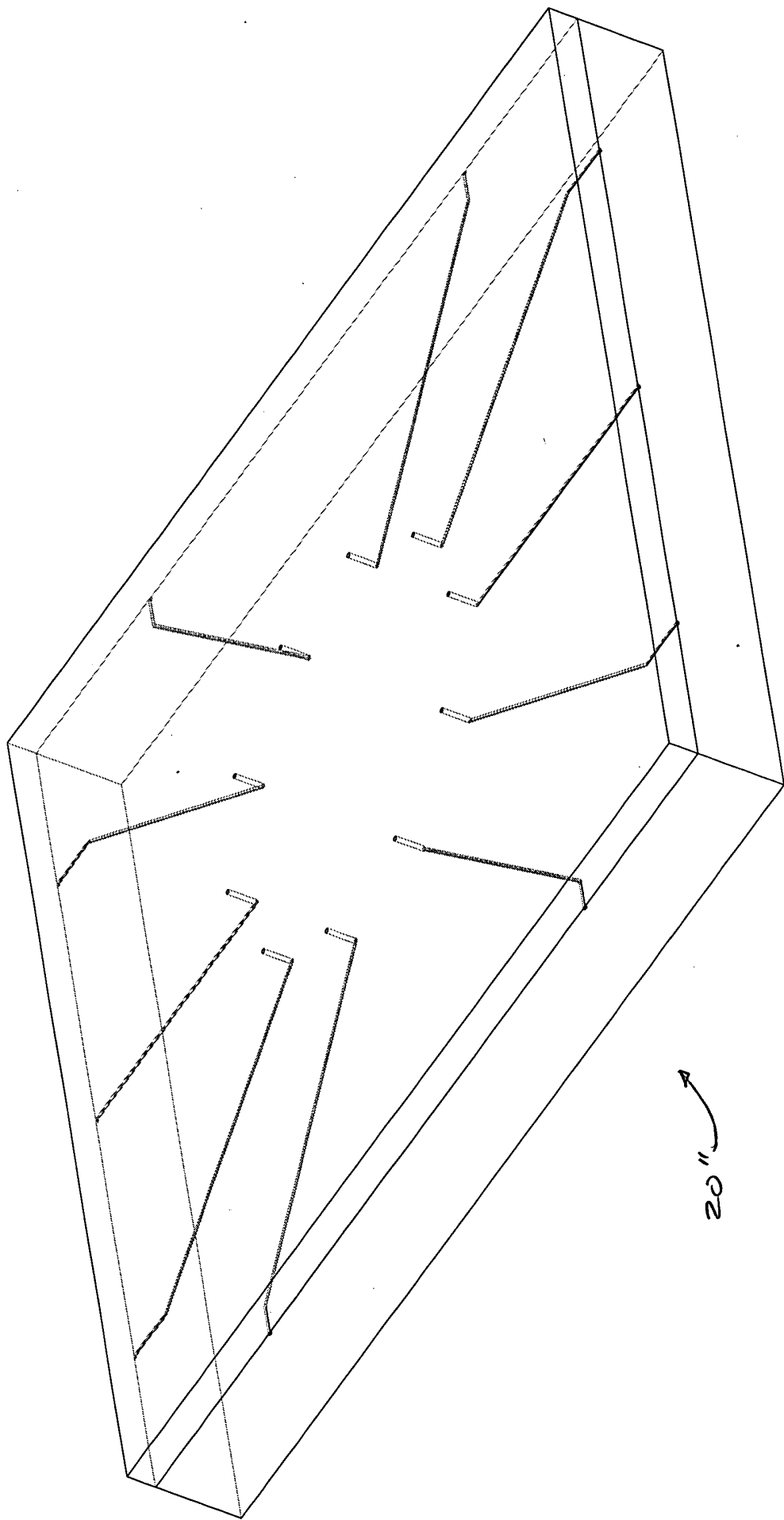
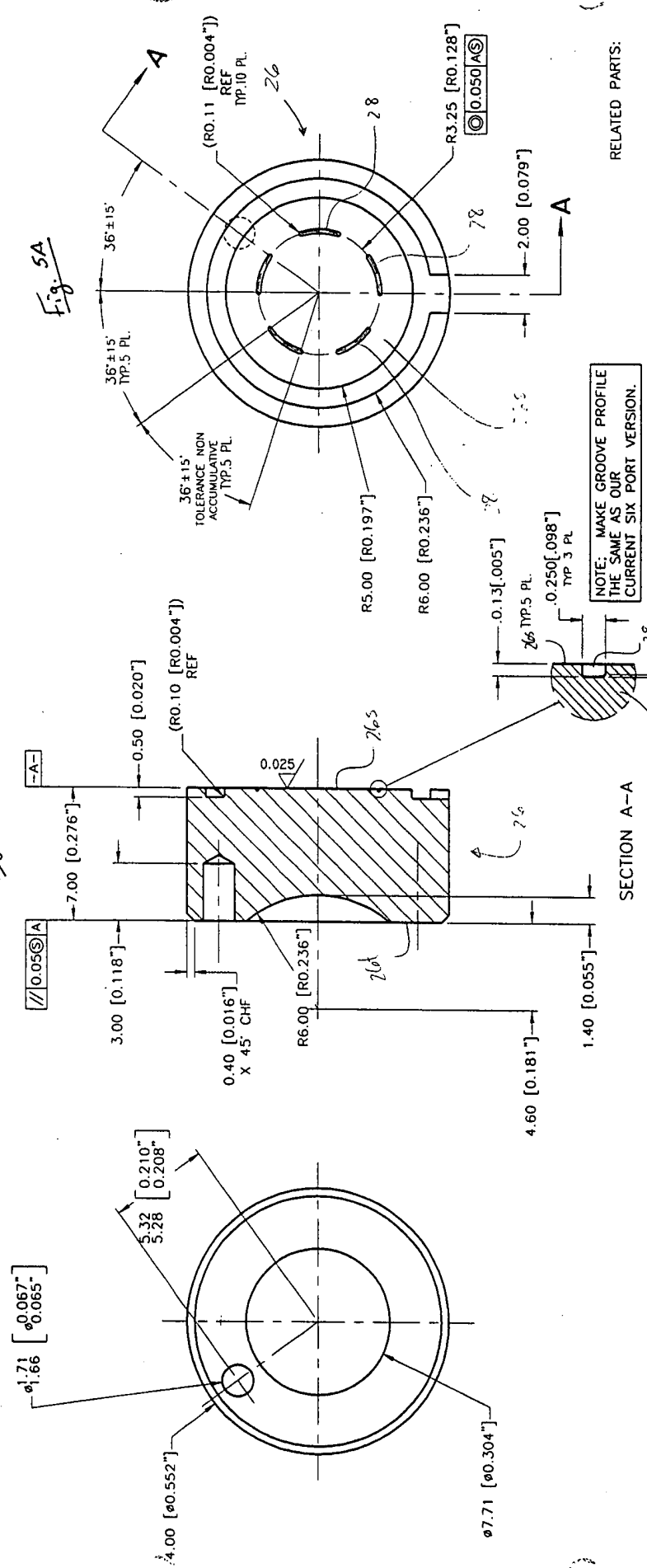


Fig. 4M

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Fig. 5B



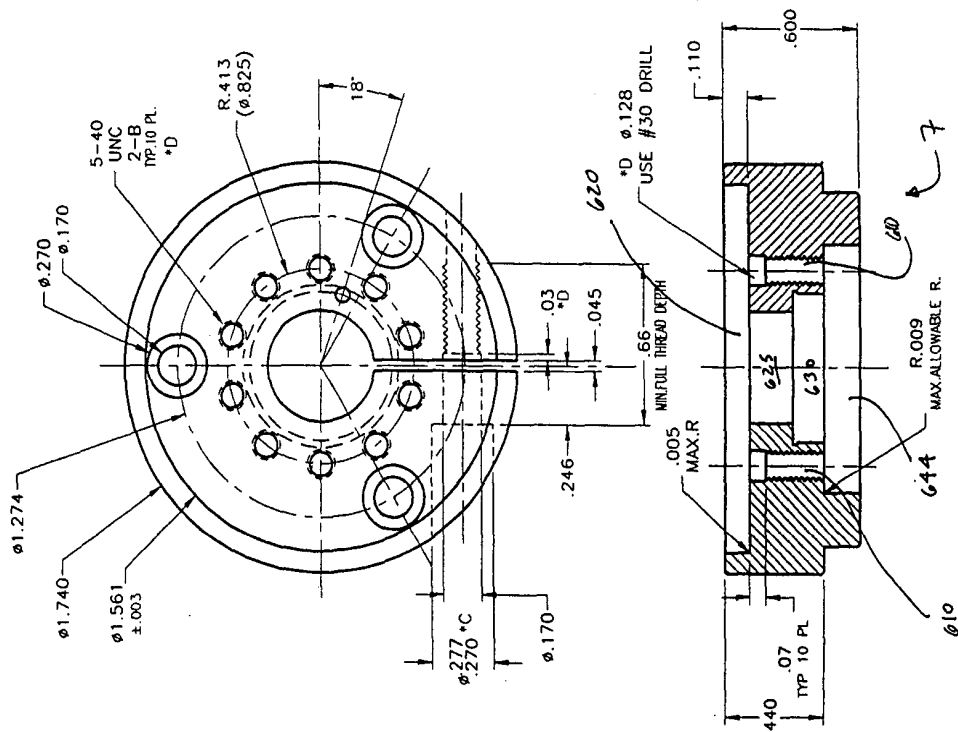
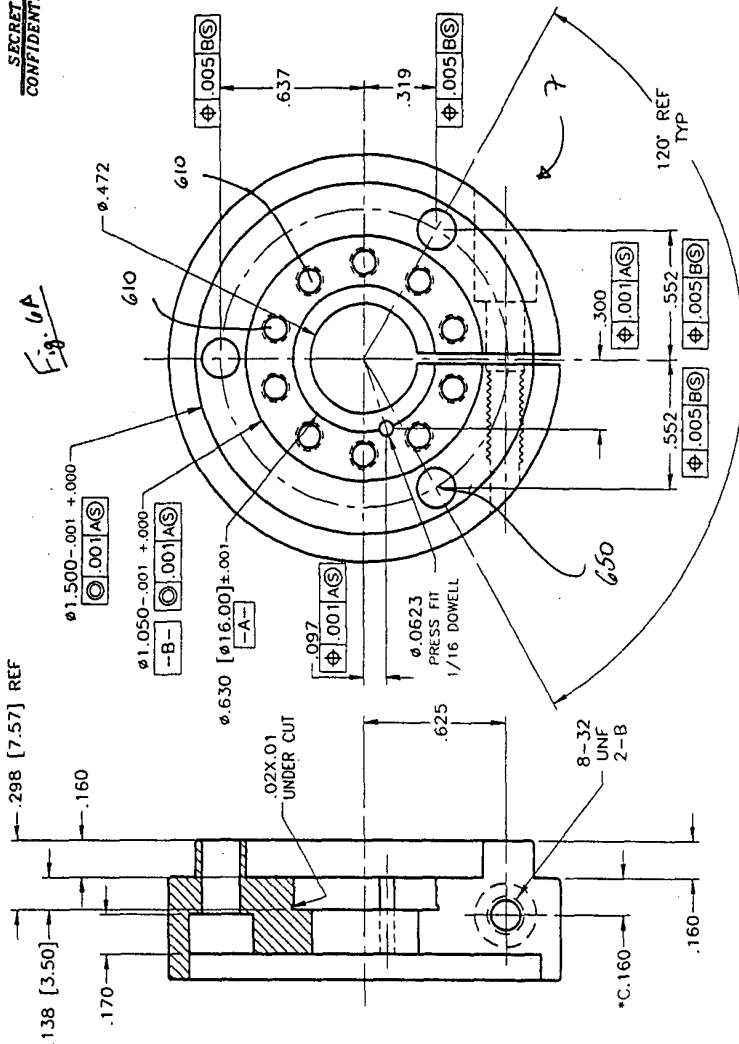
RELATED PARTS:

METRIC DIMENSIONS

| | | | |
|--|-------|----------|------|
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| NATURAL | | | |
| ZIRCONIA | | | |
| SCALE: (NATURAL) 5:1 | | | |
| TITLE: 10 PORT ROTOR. (MICRO INJECTION VALVE) | | | |
| HS | C | 02-09-01 | DATE |
| HS | B | 01-16-01 | DATE |
| HS | A | 12-13-00 | DATE |
| HS | REV. | DATE | DATE |
| HS | DRAWN | 12-05-00 | DATE |
| PART NUMBER: PRO-1167-10PT-R01 UPCHURCH SCIENTIFIC, INC. | | | |

~~SECRET~~
~~CONFIDENTIAL~~

Fig. 6A



RELATED PARTS:

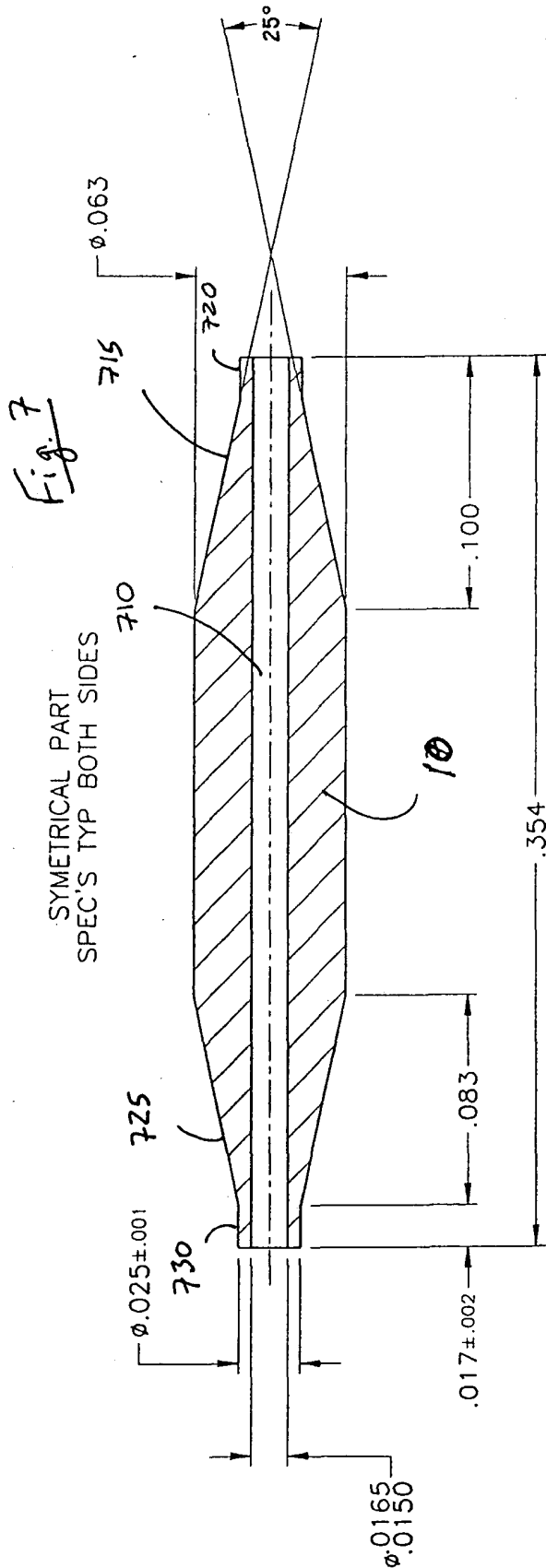
NOTES, UNLESS OTHERWISE SPECIFIED

1. SURFACE FINISH: 32 RMS
2. EDGE BREAK: .010 MAX.
3. CONCENTRICITY OF ALL DIAMETERS: .006 T.I.R. MAX.

Fig. 6B

| | | | | | | |
|--|--|---|--|--------------|--------------|------|
| © THE DESIGN IS THE PROPERTY OF SCIENTIFIC INC. ANY REPRODUCTION OF THIS DESIGN WITHOUT THE WRITTEN PERMISSION OF SCIENTIFIC INC. IS PROHIBITED. | TOLERANCES HOLE ± .0005 HOLE ± .0005 HOLE ± .0010 | | FINISHES HOLE .0005 HOLE .0005 HOLE .0010 | | SCALE 2:1 | |
| | TYPE 316 S.S.T. | | TITLE STATOR PLATE (10 PORT INJECTION VALVE) | | SHEET 1 OF 2 | |
| UPCHURCH SCIENTIFIC INC. 10000 W. 116TH ST. OVERLAND PARK, MO 66213 | | STATOR PLATE (10 PORT INJECTION VALVE) (MICROALTYNE VERSION) | | SHEET 1 OF 2 | | 1167 |

SECRET
 CONFIDENTIAL



RELATED PARTS:

NOTES, UNLESS OTHERWISE SPECIFIED

1. SURFACE FINISH: 32 RMS
2. EDGE BREAK: .003 MAX.
3. CONCENTRICITY OF ALL DIAMETERS: .003 T.I.R. MAX.

| | | | |
|---|---------------|--|--|
| THIS DRAWING IS THE PROPERTY OF UPCHURCH SCIENTIFIC, INC. CONTENTS ARE STRICTLY CONFIDENTIAL | | TOLERANCES XXXX = ±.0005 XXX = ±.005 XX = ±.010 | FRACTIONAL = ±.020 ANGULAR = ±2 DEG. UNLESS OTHERWISE SPECIFIED DO NOT SCALE THIS DRAWING |
| MATERIAL: | | SCALE: 15:1 | |
| TITLE: | | Ø1/16 PEEK TUBING | |
| FERRULE (10 PORT VALVE) | | PART NUMBER: PRO-1167- FERRULE-B | |
| HS B 05-01-01 | HS A 02-07-01 | UPCHURCH SCIENTIFIC, INC. | |
| DRAWN HS | REV. HS | DATE: 01-17-01 | PART NUMBER: PRO-1167- FERRULE-B |

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Fig. 8B

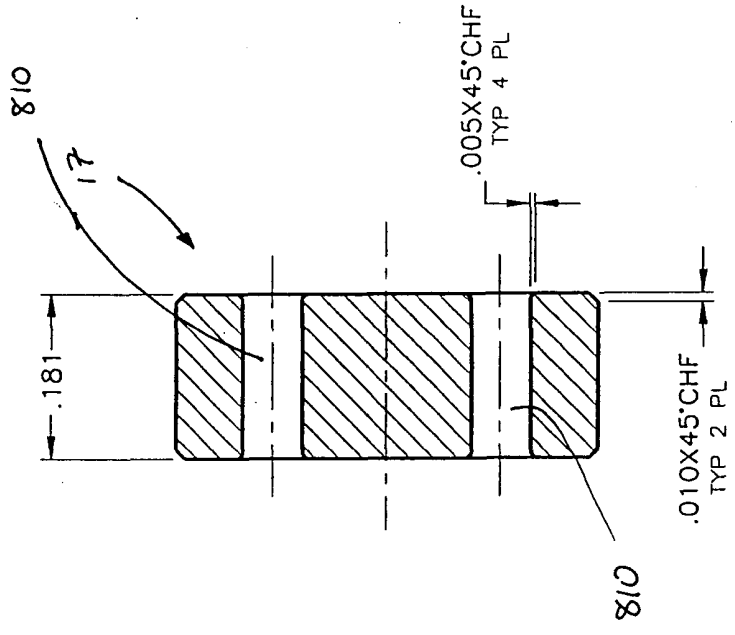
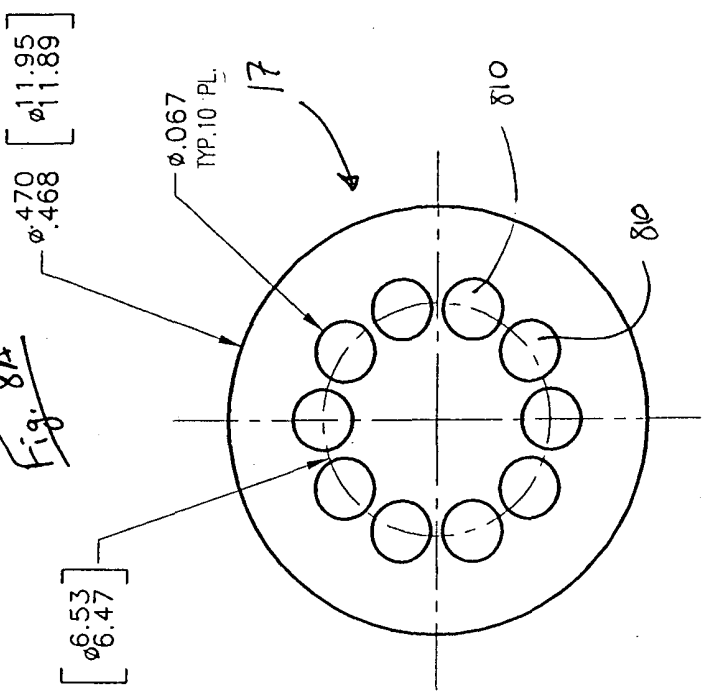


Fig. 8A



RELATED PARTS:

NOTES, UNLESS OTHERWISE SPECIFIED

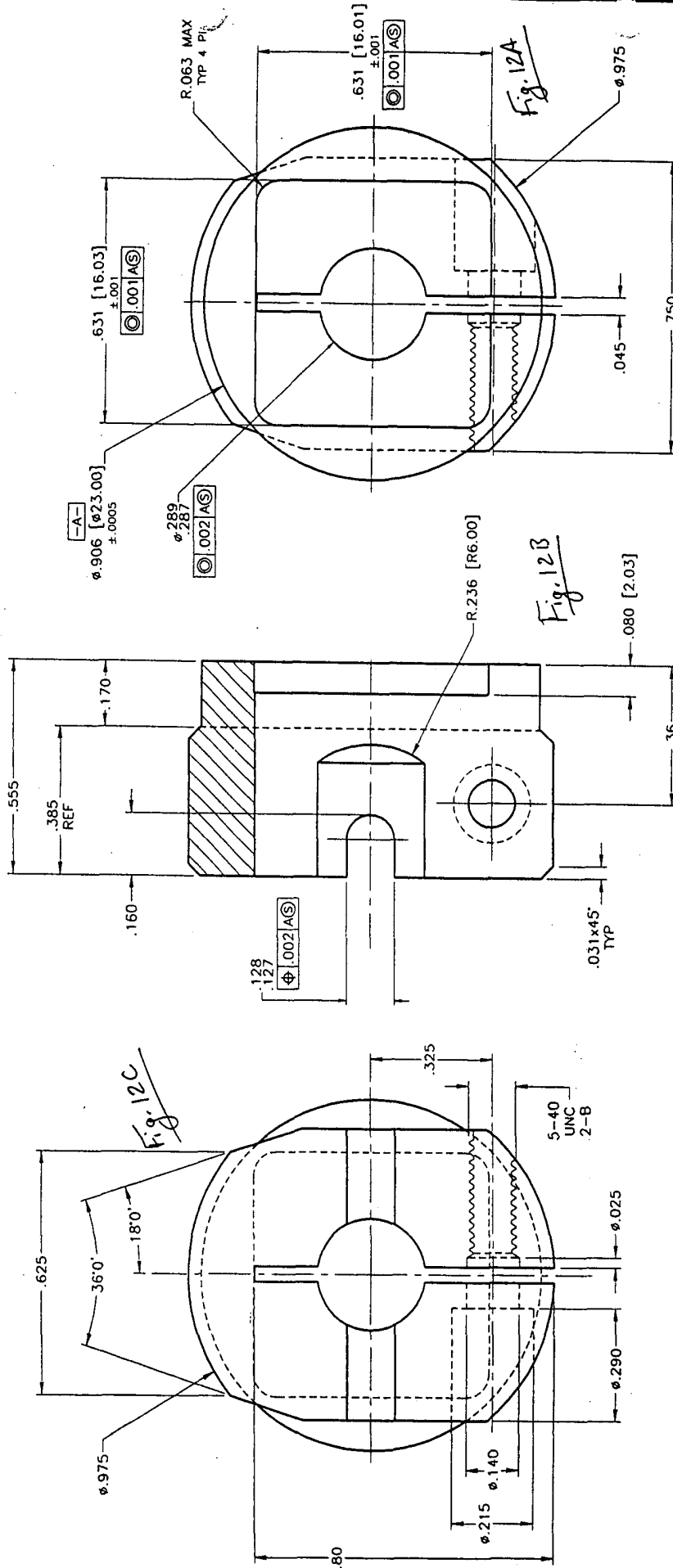
1. SURFACE FINISH: 32 RMS
2. EDGE BREAK: .010 MAX.
3. CONCENTRICITY OF ALL DIAMETERS: .006 T.I.R. MAX.

| | | | |
|---|--------|---|----------------|
| © THIS DRAWING IS THE PROPERTY OF UPCHURCH SCIENTIFIC, INC. CONTENTS ARE STRICTLY CONFIDENTIAL. | | TOLERANCES FRACTIONAL = $\pm .020$ DECIMAL = $\pm .0005$ ANGULAR = ± 2 UNLESS OTHERWISE SPECIFIED XXX = $\pm .005$ XX = $\pm .010$ DO NOT SCALE THIS DRAWING | |
| MATERIAL: PEEK, NATURAL. | | SCALE: 5:1 | |
| TITLE: FERRULE SUPPORT, (10 PORT MICRO INJECTION VALVE) | | PART NUMBER: PRO-1167 | |
| DRAWN: HS | REV: A | DATE: 04-10-01 | DATE: 12-12-00 |

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SCIENTIFIC, INC.

SECRET
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FORMAT: FILE NAME: PRO-1167-ROTOR-MOUNT-ML
REVISIONS: A: /



RELATED PARTS:

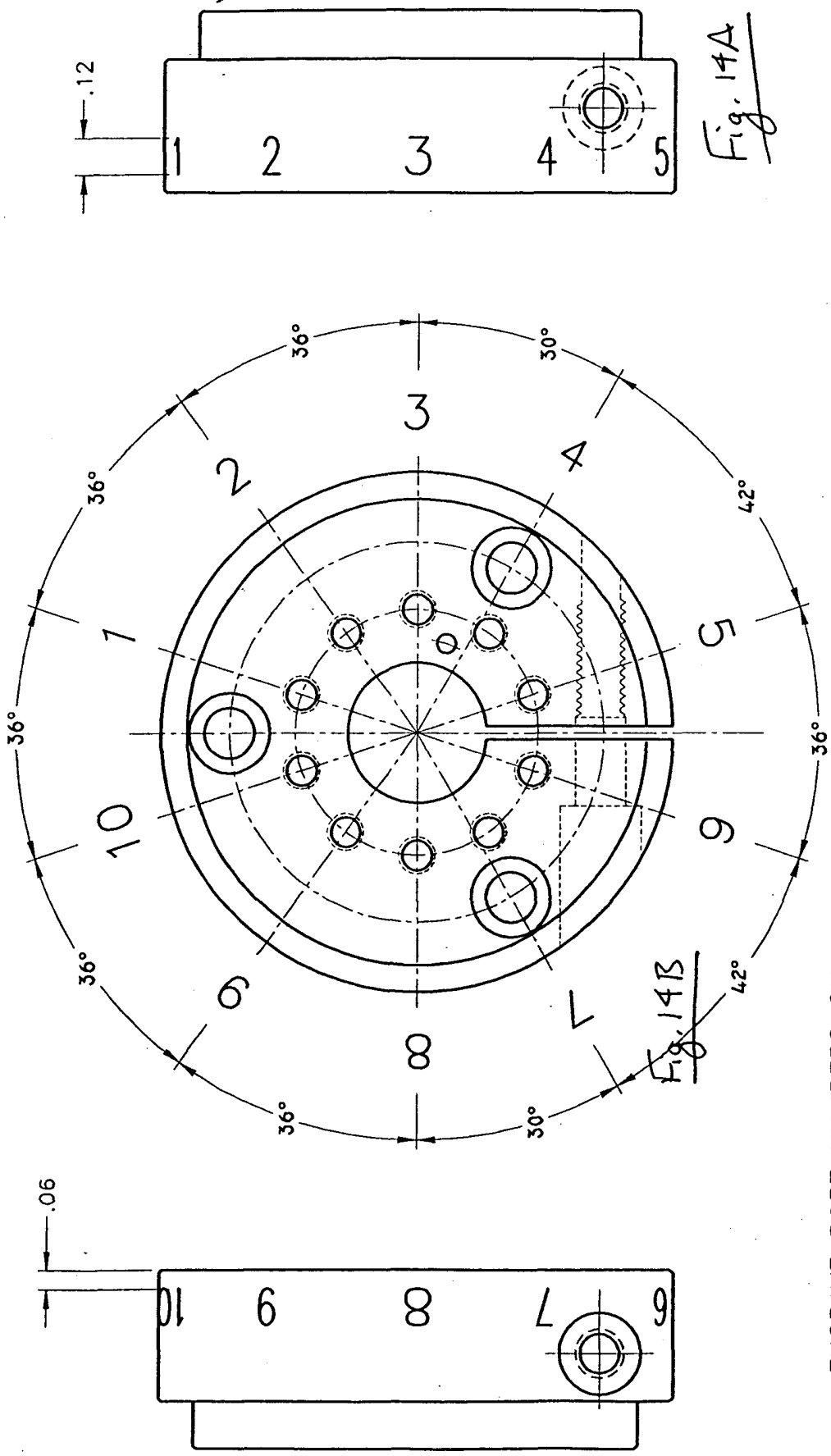
| | | |
|--|--|--|
| THE DRAWING IS THE PROPERTY OF UPCHURCH SCIENTIFIC, INC. CONTENTS ARE STRICTLY CONFIDENTIAL. | | TOLERANCES: FRACTIONAL = 1/1000 DECIMAL = 1/1000 ANGULAR = 1/1000 SURFACE FINISH = 1/1000 DO NOT SCALE THE DRAWING |
| MATERIAL: | | TYPE: 316 S.S.T. SCALE: 4:1 |
| TITLE: | | ROTOR MOUNT, (10 PORT MICRO INJECTION VALVE) |
| PART NUMBER: | | PRO-1167 |
| DATE: | | 02-02-01 |
| DRAWN BY: | | J. B. H. |
| CHECKED BY: | | J. B. H. |
| APPROVED BY: | | J. B. H. |
| COMPANY: | | UPCHURCH SCIENTIFIC, INC. |
| PART NAME: | | ROTOR MOUNT-ML |

NOTES, UNLESS OTHERWISE SPECIFIED

1. SURFACE FINISH: 32 RMS
2. EDGE BREAK: .010 MAX.
3. CONCENTRICITY OF ALL DIAMETERS: .006 T.I.R. MAX.

SECRET
CONFIDENTIAL

FILE NAME: PRO-1167-STATOR-PLATE-ML-2
REVISIONS: A: /



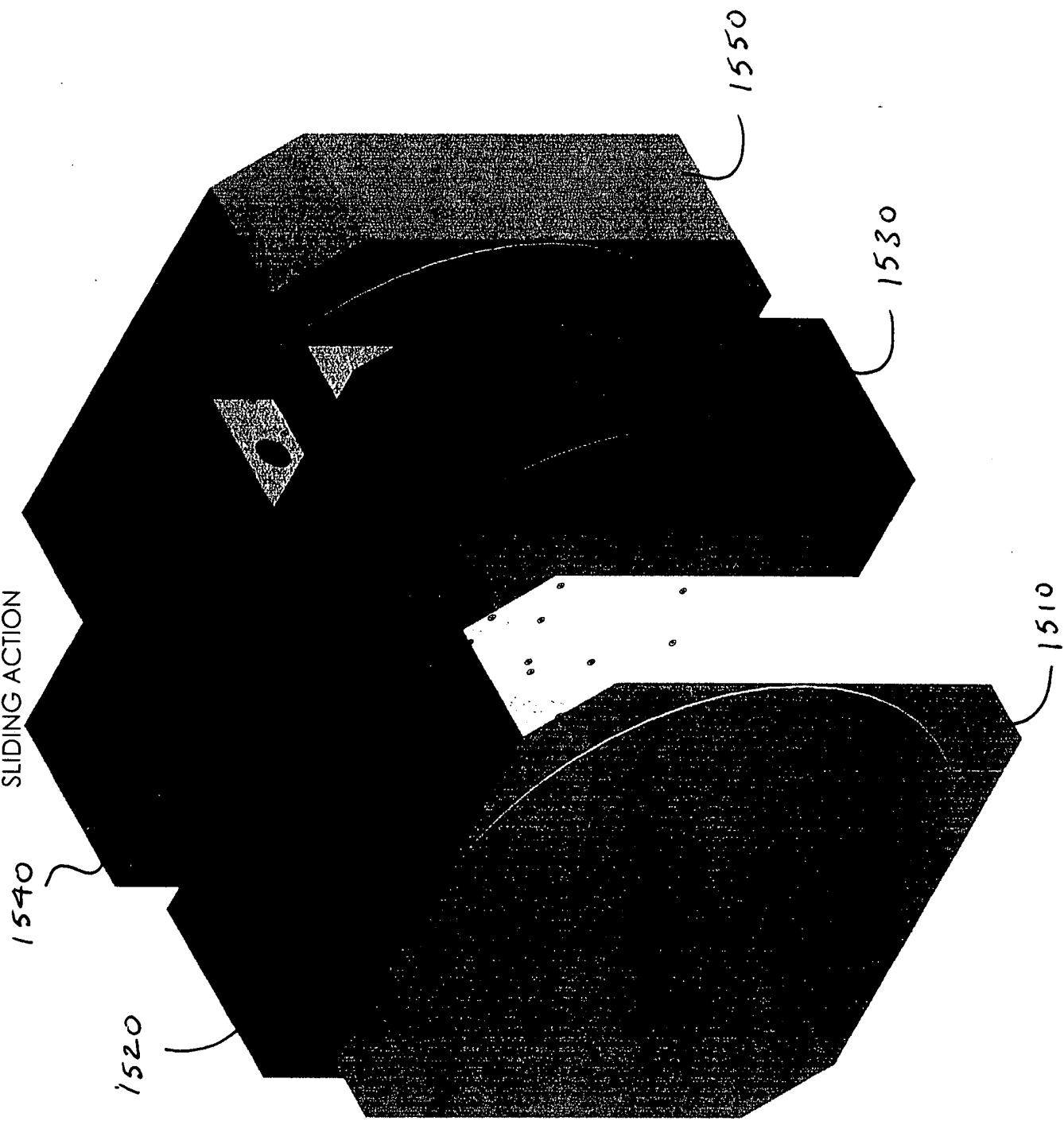
ENGRAVE PORT NUMBERS ON PERIMETER OF PART, AS SHOWN.

| | | |
|--|-----------|---------------------|
| TOLERANCES XXXX = ±.0005 XXX = ±.005 XX = ±.010 FRACTIONAL = ±.020 ANGULAR = ±2 DEG. UNLESS OTHERWISE SPECIFIED DO NOT SCALE THIS DRAWING | | SCALE: 2:1 |
| © THIS DRAWING IS THE PROPERTY OF UPCHURCH SCIENTIFIC, INC. CONTENTS ARE STRICTLY CONFIDENTIAL | | |
| MATERIAL: | | |
| TITLE: STATOR PLATE (10 PORT INJECTION VALVE) | | |
| PART NUMBER: PRO-1167 STATOR-PLATE-ML SHEET 1 OF 2 | | |
| HS DRAWN | A REV. | X DATE: 04-05-01 |

UPCHURCH
SCIENTIFIC, INC.

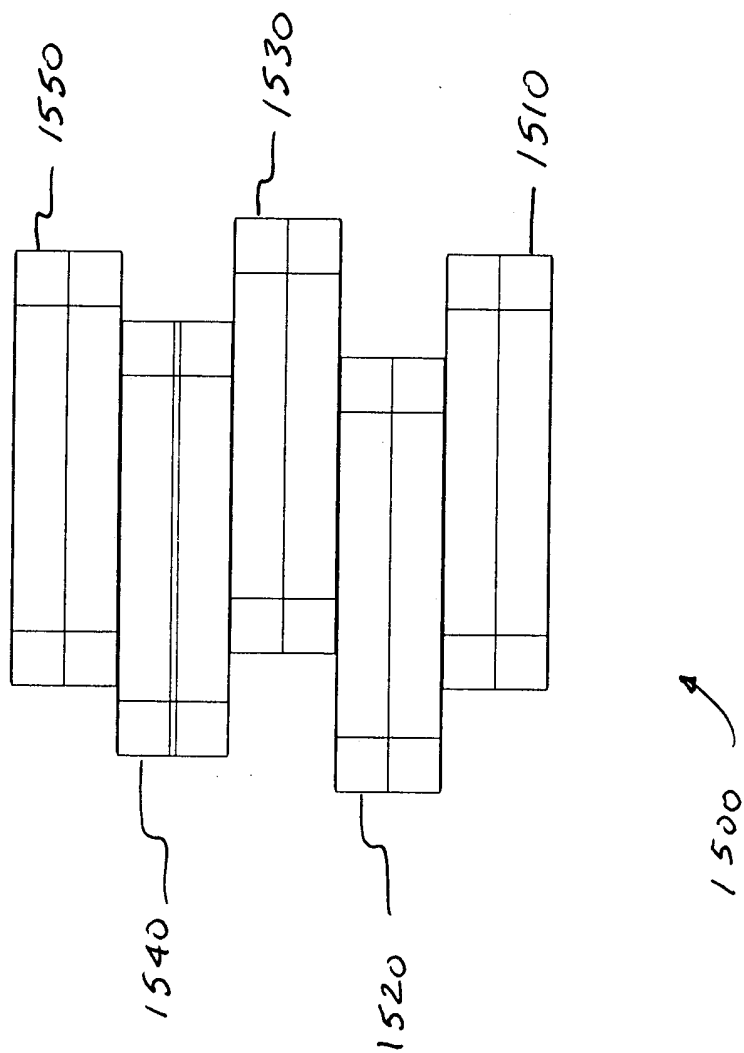
ACTIVE MICRO-FLUIDIC VALVE BODY
LAYERED DESCRETE
FUNCTION ELEMENTS
SLIDING ACTION

Fig. 15



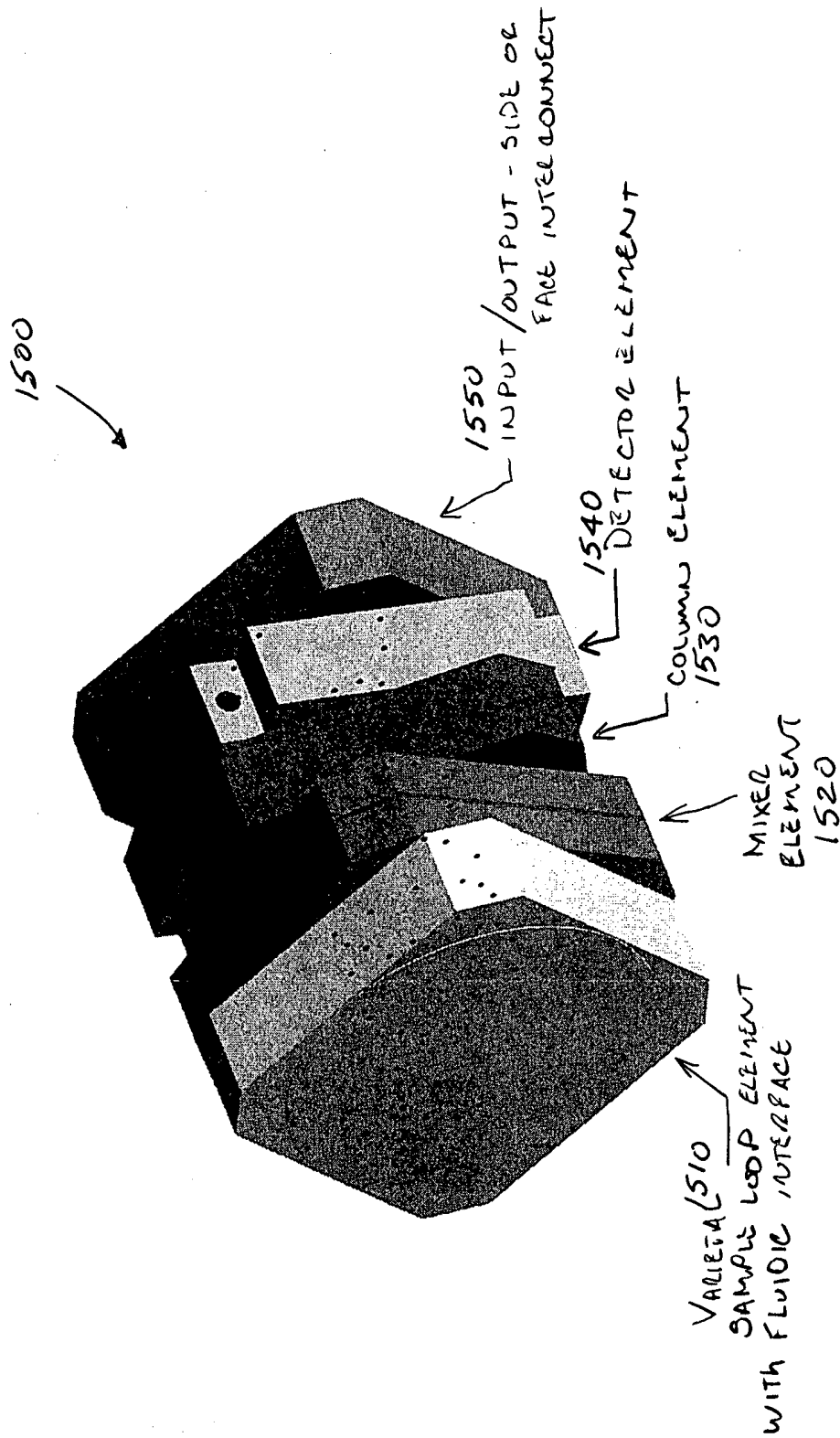
ACTIVE MICRO-FLUIDIC VALVE BODY
 LAYERED DESCRETE
 FUNCTION ELEMENTS
 SLIDING ACTION

Fig. 15A



ACTIVE MICRO-FLUIDIC VALVE BODY SYSTEM
 LAYERED DISCRETE FUNCTION ELEMENTS
 Discrete! ROTATING ACTION

Fig. 15B



-ROTATION OF ONE LAYER RELATIVE TO ANOTHER ENGAGES OR ISOLATES OR BYPASSES MICRO-FLUIDIC FUNCTION OR FUNCTIONS OF INDIVIDUAL ELEMENTS.

VARIETAL SAMPLE LOOP

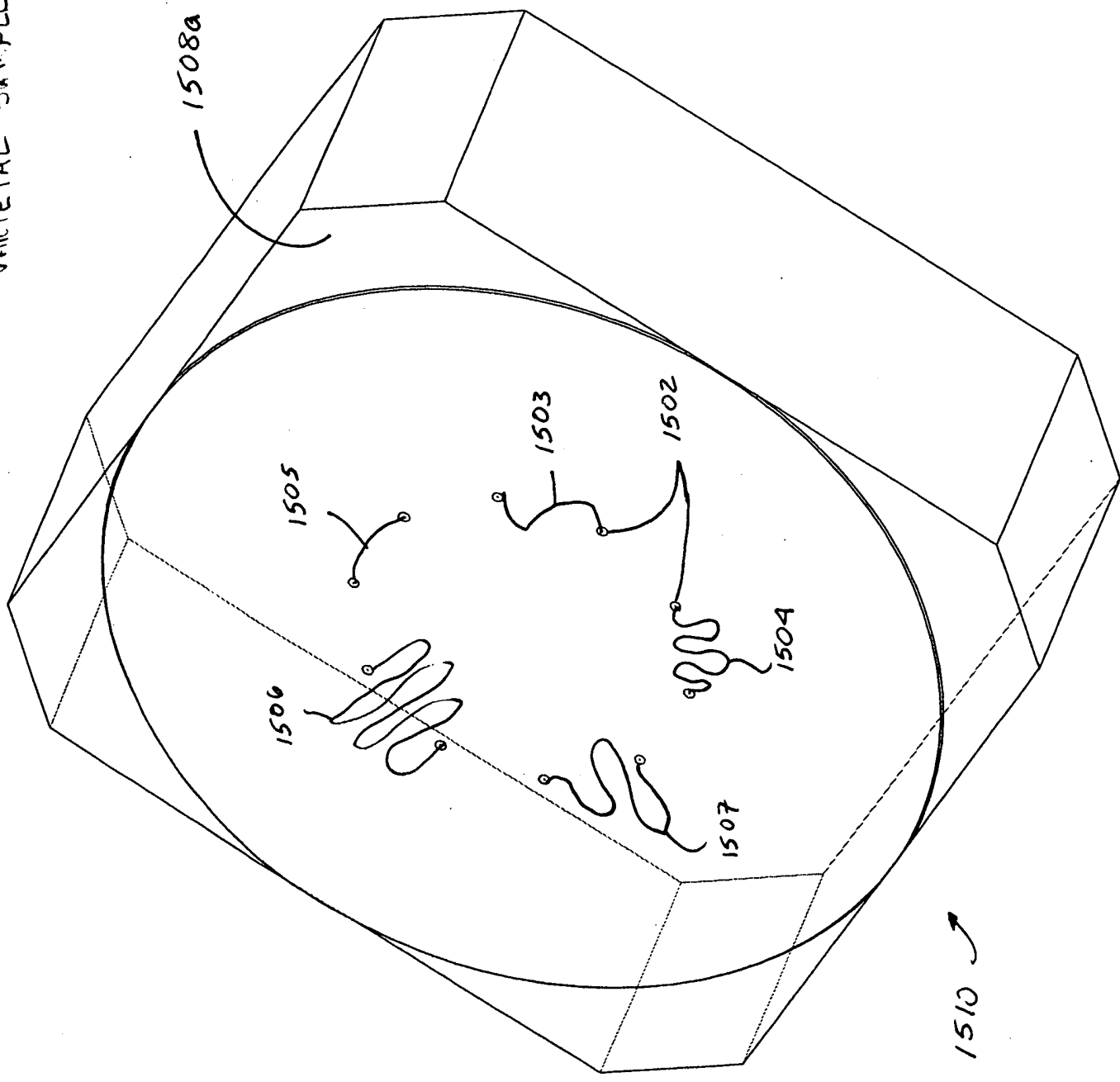


Fig. 15C

MIXER

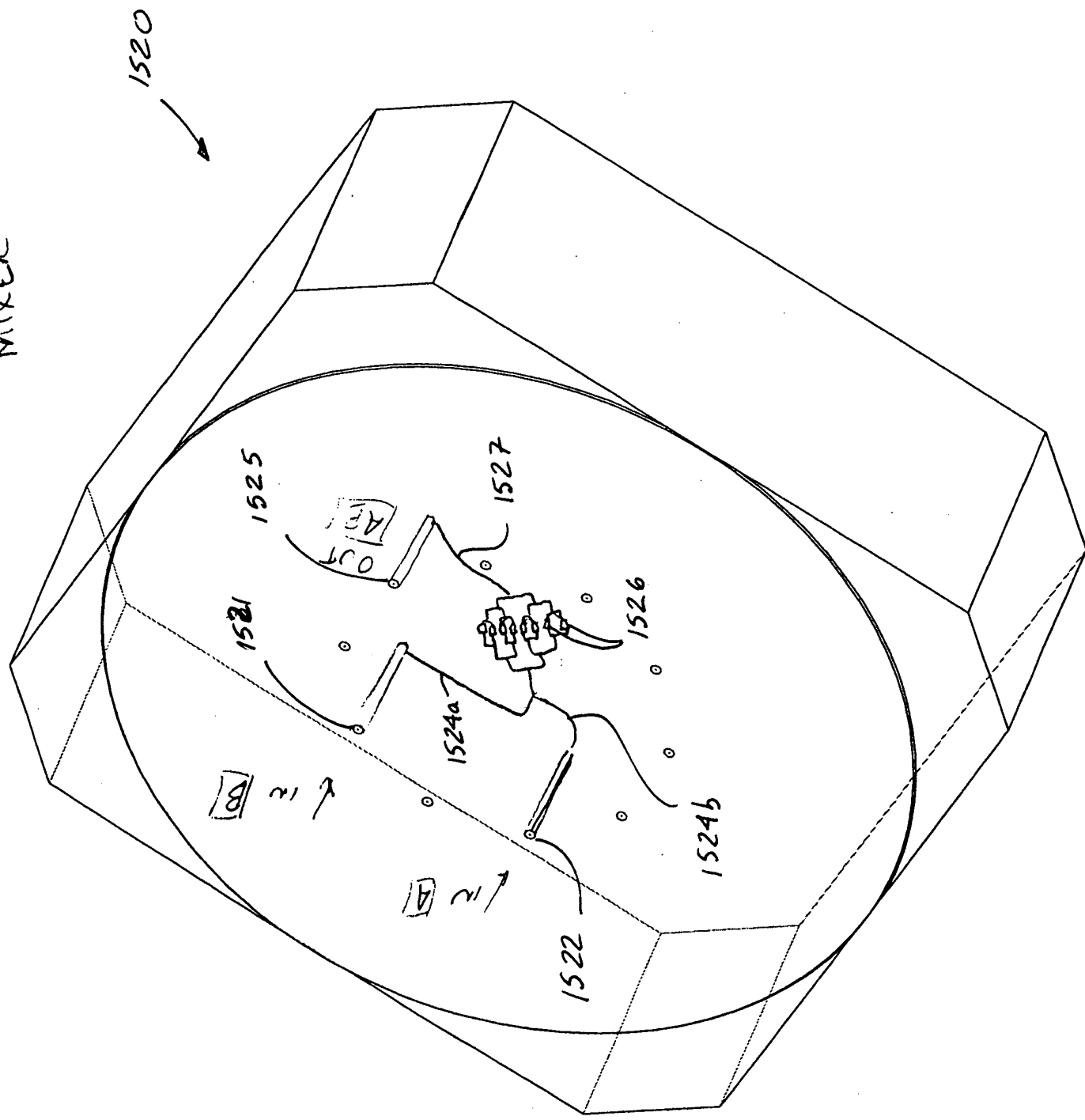


Fig. 15D

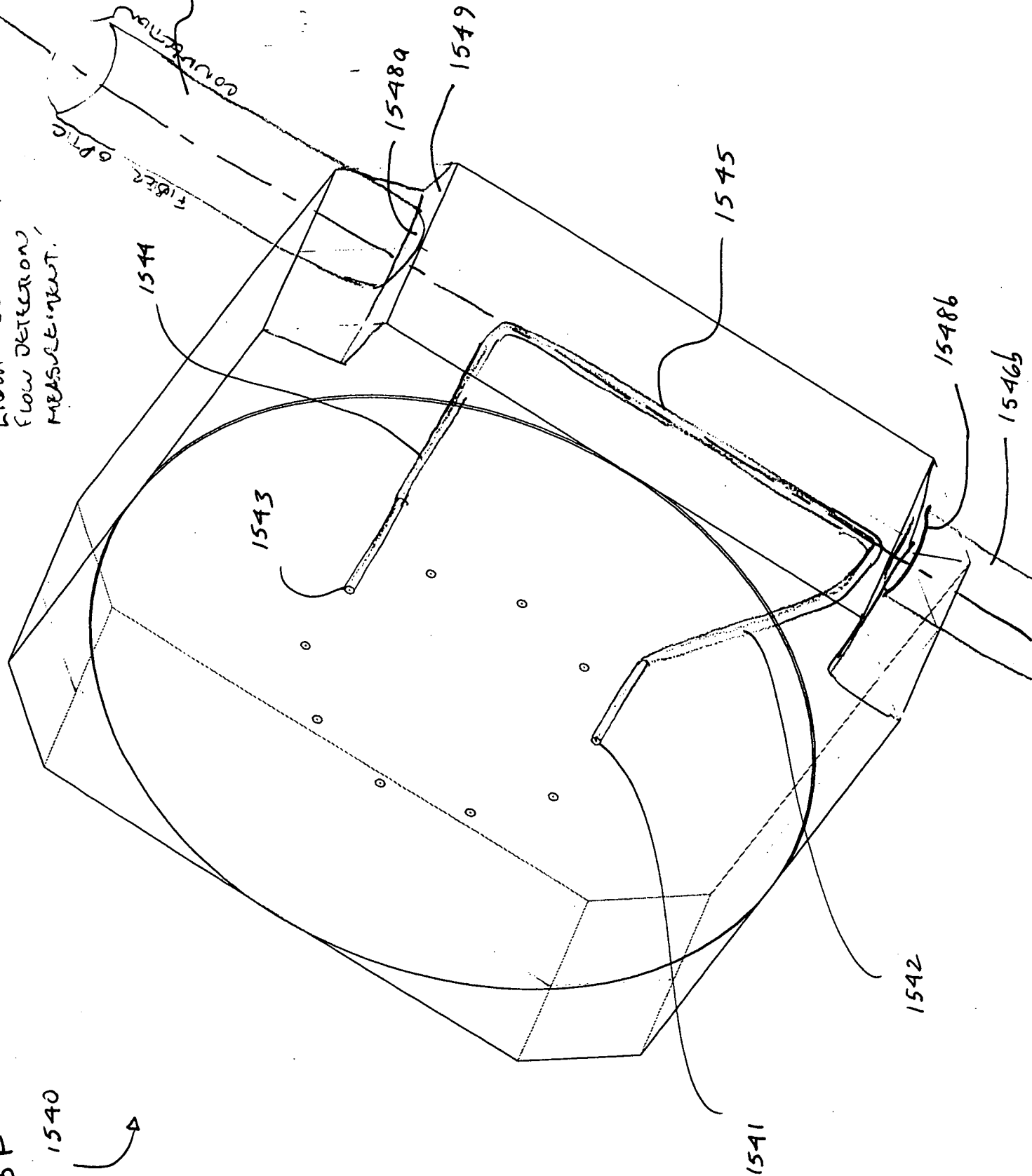
Fig. 51

Fig. 15F

1540



FLOW CELL
LIGHT SENSING,
FLOW DETECTION,
MEASUREMENT.



Flow Sensor

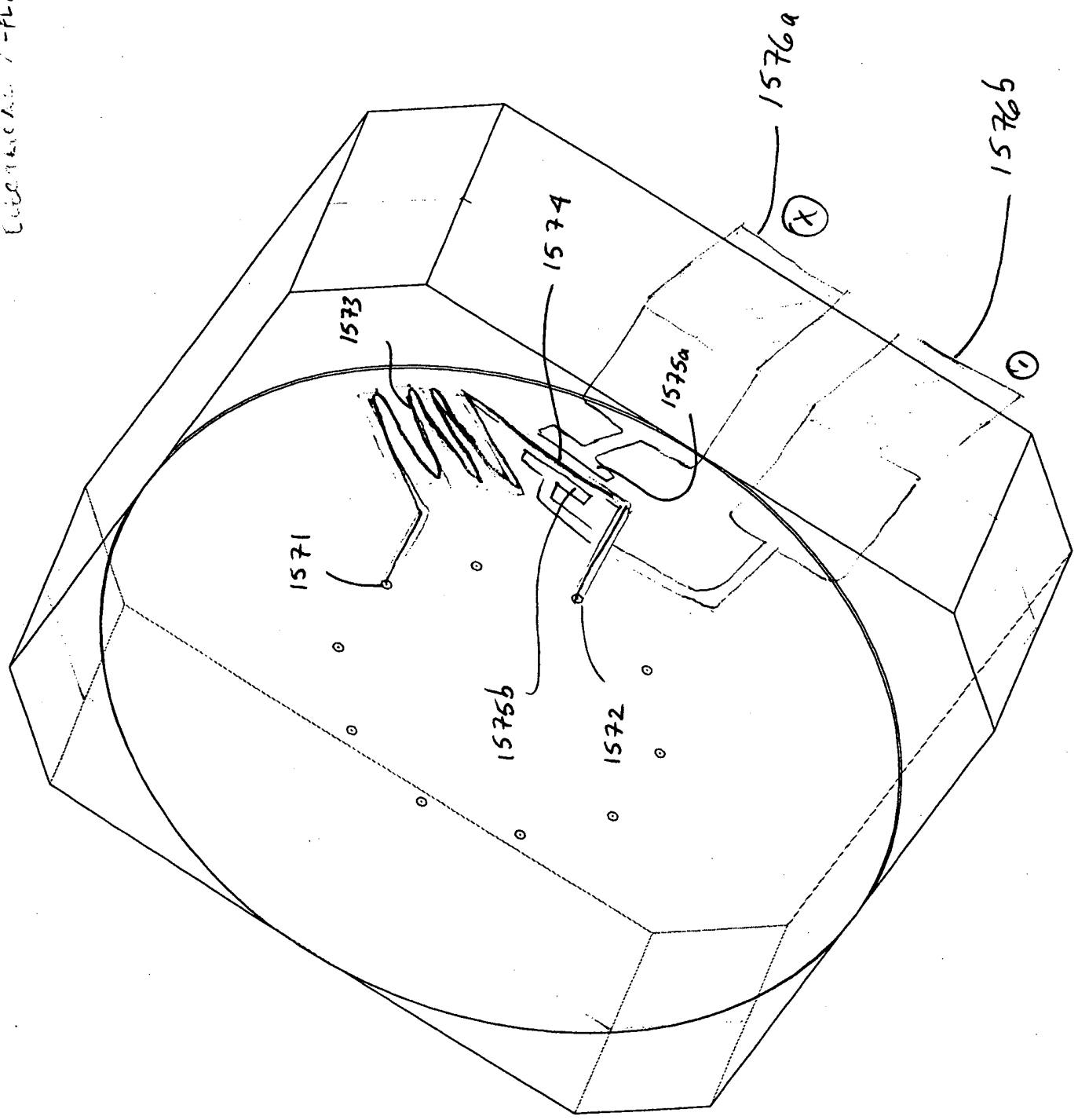
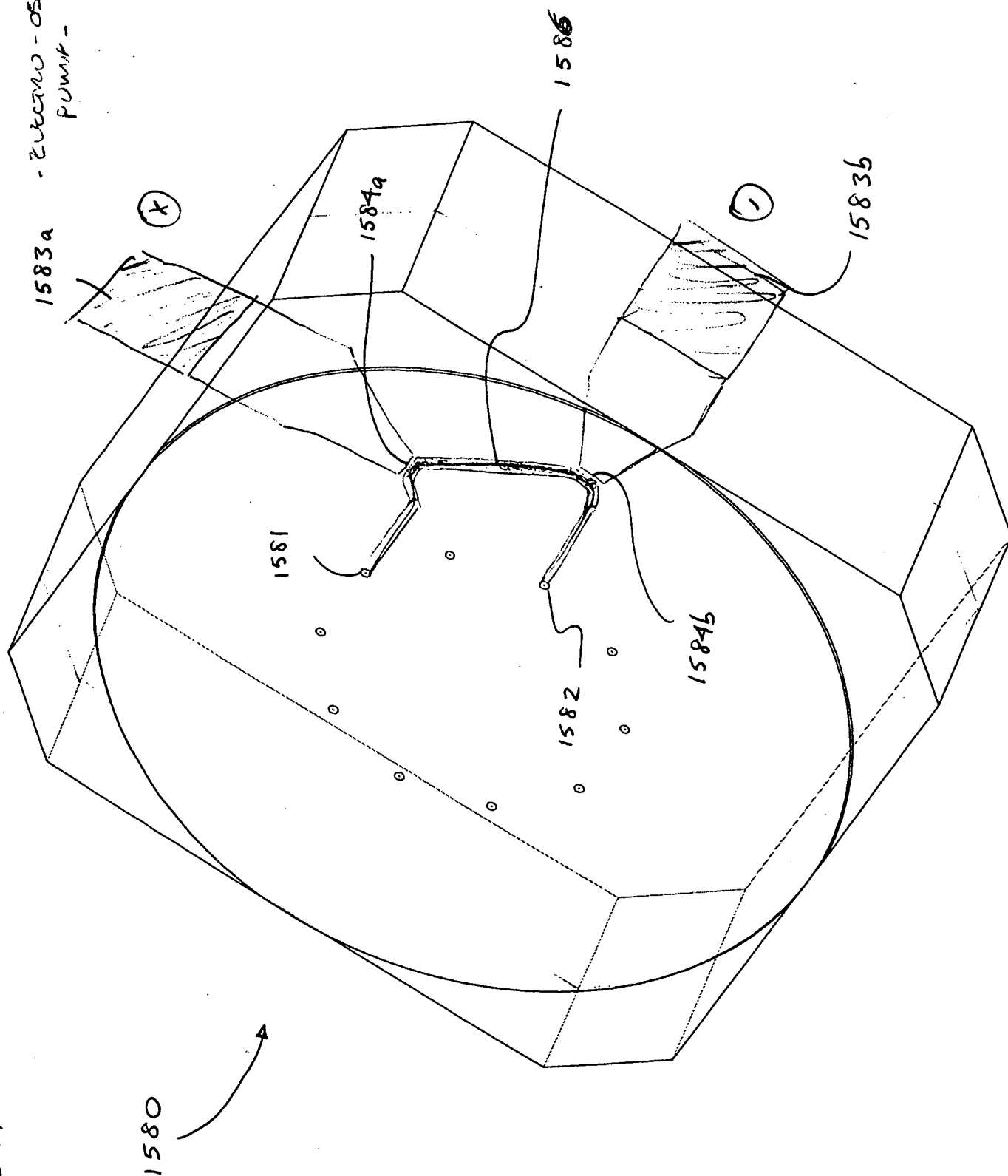


Fig. 156

1570

1583a ELECTRIC - ELECTRO-OSCILLIC PUMP -



ELECTRIC
HEATER/COOLER

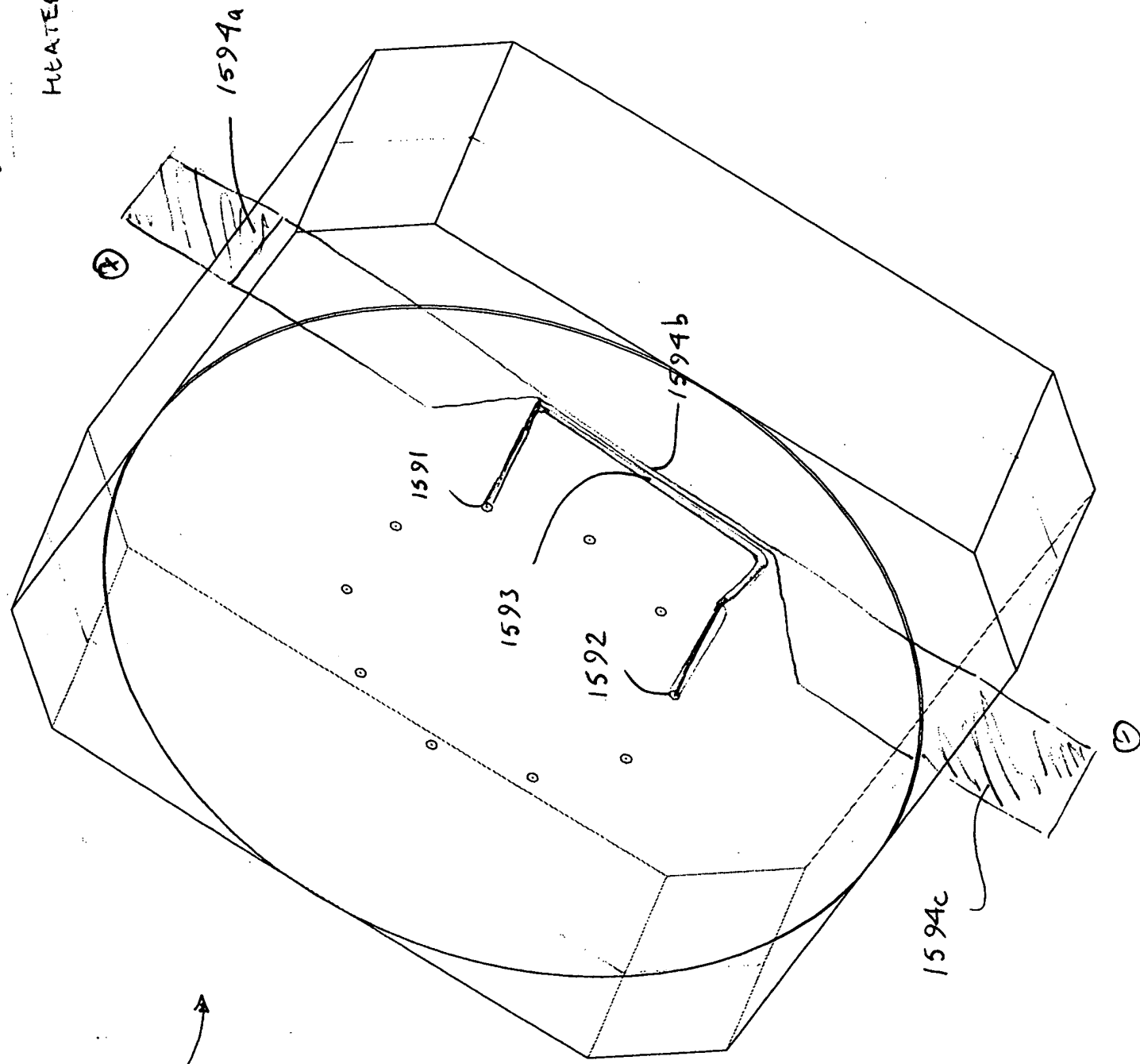


Fig. 15 I

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Fig. 16D

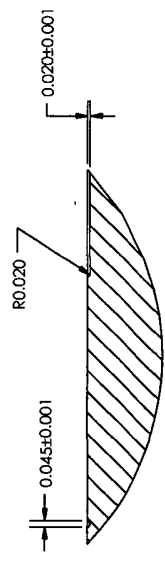
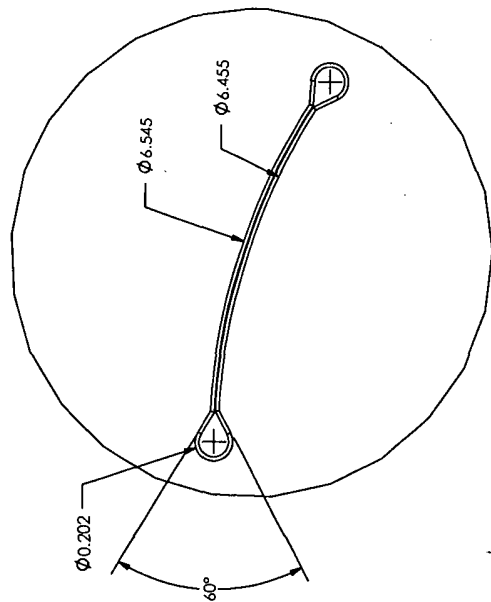
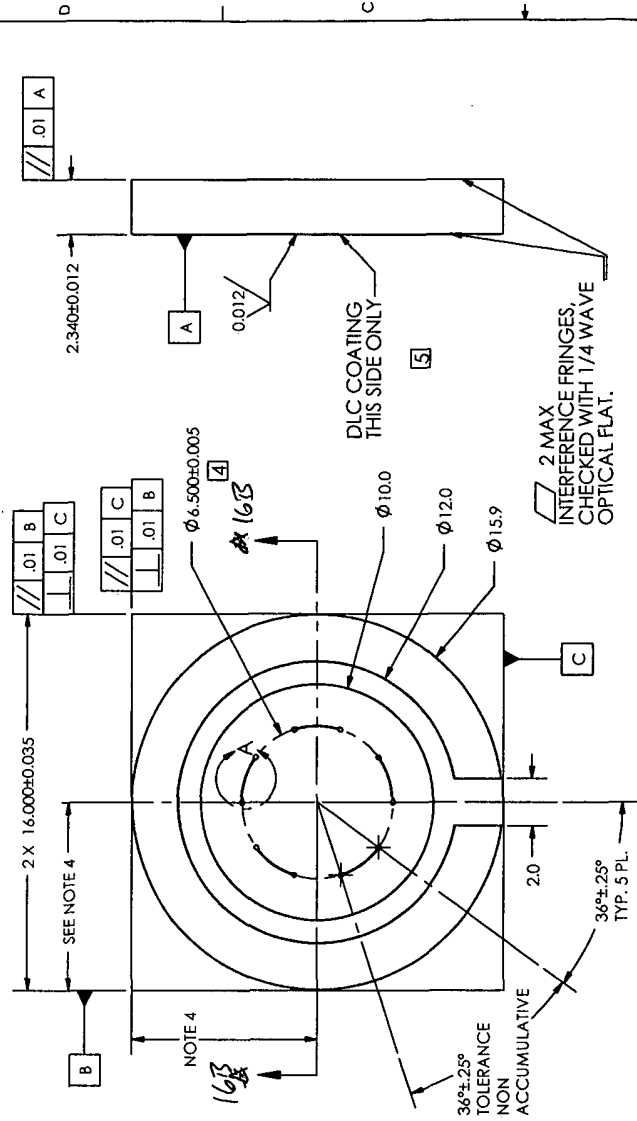


Fig. 16A



SECTION A-A

Fig. 16B

NOTES, UNLESS OTHERWISE SPECIFIED:

1. SURFACE FINISH: 0.40 [1.6 RMS]
2. EDGE BREAK: .020 [0.008"] MAX
3. CONCENTRICITY OF ALL DIAMETERS: .05 [0.002"] I.R. MAX
4. GROOVE PATTERN TO BE CENTERED WITHIN SQUARE ±.035 [0.014"]
5. DIAMONEX EVERSCAN COATING
6. (FLUID GROOVE VOLUME 2.7nl)

CONCEPT DRAWING

| REV. | DESCRIPTION | DATE | BY |
|------|--|----------|-----|
| A | ADD SHEET WITH DETAIL VIEW TO SHOW RELIEF EACH OUTSIDE 16.0 DIAMETER | 04-09-01 | THD |
| B | NEW EACH DEPTH 20.0, WAS 34.0, ADD. NOTES TOLERANCE | 05-07-02 | THD |
| C | ADJUSTED GROOVE GEOMETRIC FOR NEW EACH DEPTH, VOL. NOTE | 05-09-02 | THD |

| | | | | | |
|---|--------|--|------|--|--|
| UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS TOLERANCES ARE +/-0.050 | | C/S OPERATED DRAWING DO NOT MANUALLY UPDATE | | UPCHURCH SCIENTIFIC, INC. | |
| APPROVAL | DATE | APPROVAL | DATE | 10 PORT MICRO- INJECTION VALVE ROTOR | |
| DRAWN | THD | DRAWN | THD | | |
| CHECKED | | CHECKED | | | |
| MATERIAL | QUARTZ | MATERIAL | | | |
| FINISH | | FINISH | | | |
| DO NOT SCALE DRAWING | | DO NOT SCALE DRAWING | | | |
| SCALE | 5:1 | SCALE | 5:1 | PROJ-1167-ROTOR-ML | |
| | | | | REV. C | |

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THE WRITTEN PERMISSION OF UPCHURCH SCIENTIFIC, INC. IS PROHIBITED.

| REV. | DESCRIPTION | DATE | INITIALS |
|------|---|----------|----------|
| A | ADD DETAIL VIEW TO SHOW RELIEF ETCH OUTSIDE 16.0 DIAMETER | 04-09-01 | THD |
| B | NEW ETCH DEPTH 20um. WAS 35um. ADDL. NOTES, TOLERANCES | 05-07-02 | THD |
| C | ADJUST GROOVE GEOMETRY, VOL. NOTE | 05-08-02 | THD |

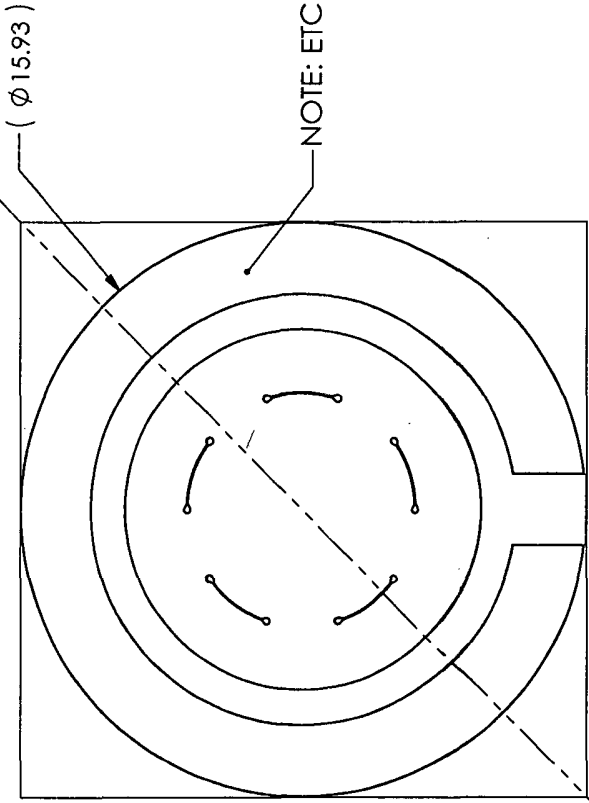


Fig. 16E

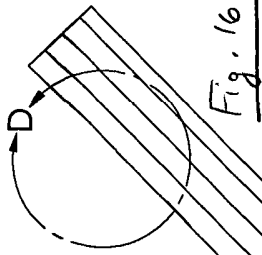


Fig. 16F

NOTE: ETCH OUTSIDE OF Ø16.0 TO SAME
DEPTH AS FLUID GROOVES

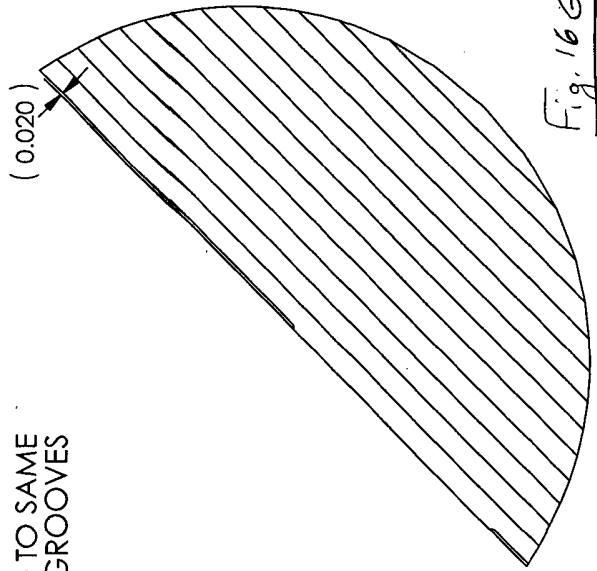


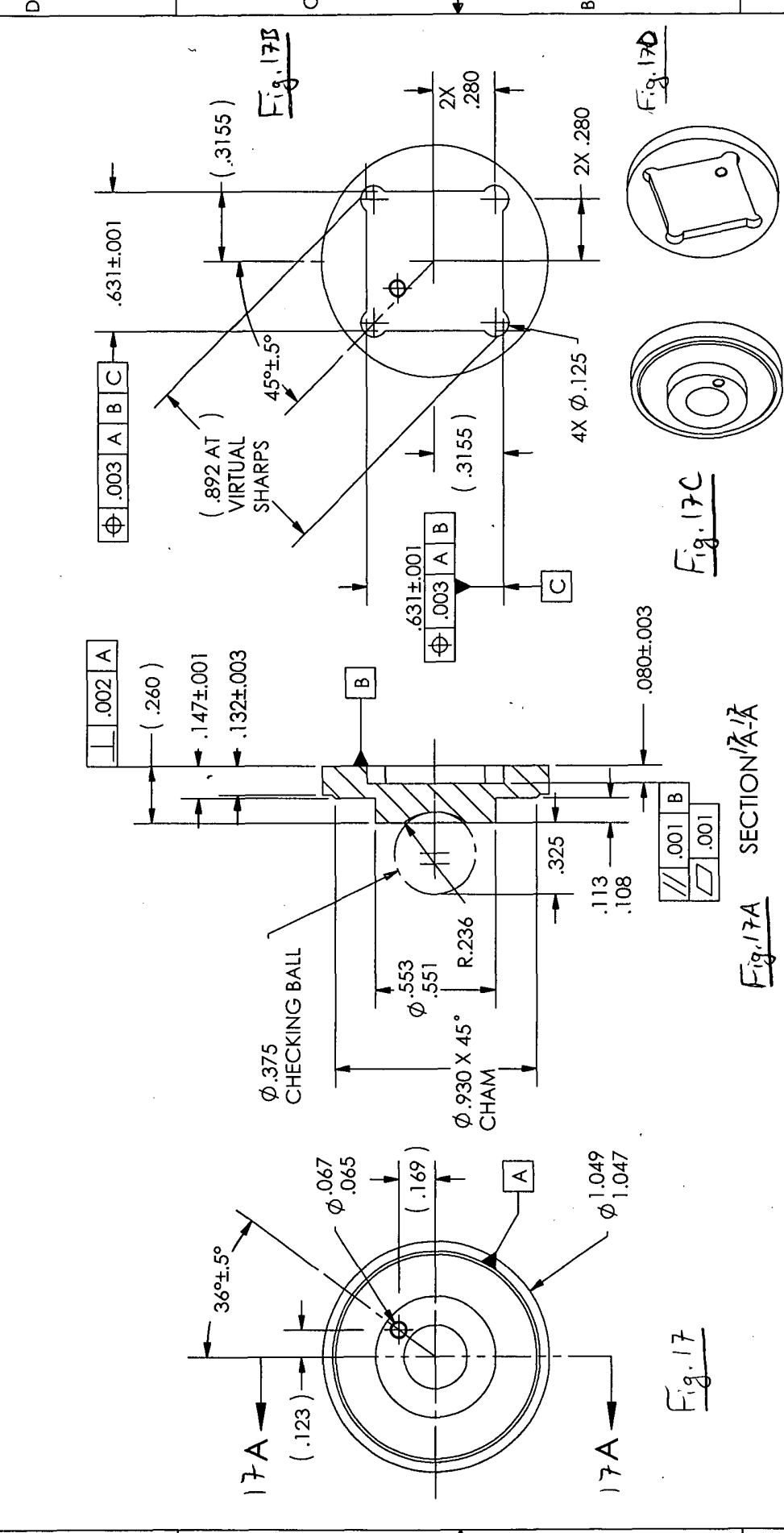
Fig. 16G

DETAIL D
SCALE 20:1

SECTION ~~EE~~ 16F-16F

| | | | | | |
|---|--|--|---------------|--|----------------------------|
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS | | CAD GENERATED DRAWING. DO NOT MANUALLY UPDATE | | UPCHURCH SCIENTIFIC, INC. | |
| TOLERANCES ARE: +/-0.050 | | APPROVALS | | 10 PORT MICRO- INJECTION VALVE ROTOR | |
| MATERIAL QUARTZ | | DRAWN THD | DATE 03-29-01 | SIZE DWG. NO. | REV. |
| FINISH XX | | CHECKED | | A | C |
| DO NOT SCALE DRAWING | | RESP ENG | | PRO-1167-ROTOR-ML | |
| | | MFG ENG XX | XX-XX-XX | SCALE 5:1 | CAD FILE PRO-1167-ROTOR-ML |
| | | QUAL ENG | | SHEET 2 OF 2 | |

| REVISIONS | | | | INITIALS | |
|-----------|---|------|------|----------|------|
| REV. | DESCRIPTION | DATE | DATE | DATE | DATE |
| A | "ADDED CORNER RELIEF AND GEO. TOLS. TO STATOR POCKET 05-15-01 | HS | | | |
| B | NEW PRINT - S.W. - ADDED RELIEF TO BACK OF LG. DIA | THD | | | |
| | | | | | |
| | | | | | |



| | | | | | | | | | | | |
|---|--|--|--|--|--|--|--|---|--|--|--|
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ±.020 ±.0005 ±2° XXX ±.005 XX ±.010 | | | | CAD GENERATED DRAWING. DO NOT MANUALLY UPDATE | | | | UPCHURCH SCIENTIFIC, INC. | | | |
| MATERIAL BEARING GRADE PEEK | | | | APPROVALS | | | | ROTOR MOUNT INSERT, QUARTZ WAFER | | | |
| FINISH 32 RMS | | | | DRAWN THD | | | | DATE 05-15-02 | | | |
| DO NOT SCALE DRAWING | | | | CHECKED | | | | SIZE A | | | |
| | | | | RESP ENG | | | | DWG. NO. PRO-1167-ROT-INSERT | | | |
| | | | | MFG ENG | | | | REV. B | | | |
| | | | | QUAL ENG | | | | SCALE 1.5:1 CAD FILEPRO-1167-ROT-INSERT | | | |
| | | | | | | | | SHEET 1 OF 1 | | | |

- NOTES, UNLESS OTHERWISE SPECIFIED:
1. SURFACE FINISH: 32 RMS
 2. EDGE BREAK: .010 MAX
 3. CONCENTRICITY OF ALL DIAMETERS: .006 T.I.R. MAX
 4. CLEAN AND FREE OF BURRS